

Freshwater Aquaculture in Florida: Highlights of a 1983 Survey

Mike Knox, Florida Game and Fresh Water Fish Commission,
Aquaculture Project, 820 East Robson Street,
Lakeland, FL 33805

Abstract: The freshwater aquaculture industry in Florida was surveyed by mail in 1983. Of the aquaculturists who responded, 74% raised ornamental fish; 14% raised food, bait, and/or gamefish; 9% raised alligators; and another 3% raised fish, but did not indicate the species. Respondents to the survey had 7,094 ponds that covered 264 ha with an annual production value of \$6,775,719.50. Using survey data and assuming there were 300 aquaculture firms in the state, it was estimated that there were 27,300 ponds covering 1,093 ha, with an annual production value of \$37,642,884. Ornamental fish culture was by far the dominant form of aquaculture in Florida.

Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 38:407-412

Aquaculture in Florida began in the 1930s (Socoloff 1980). Only recently have attempts been made to survey this industry (Kerr 1974, Drda and Knox 1981 and Taber 1982). Florida fish culturists supply approximately 90% of the domestically produced ornamental fishes sold in the United States (Brown and Gratzek 1980). Although a wide variety of species such as channel catfish (*Ictalurus punctatus*), alligator (*Alligator mississippiensis*), largemouth bass (*Micropterus salmoides floridanus*), tilapia (various *Oreochromis* species), American eel (*Anguilla rostrata*), hybrid striped bass (*Morone saxatilis* x *M. chrysops*), and freshwater shrimp (*Macrobrachium rosenbergii*) have been cultured, successful commercial production of food, bait/game fishes, or alligators is a fairly recent development in Florida and production levels are comparatively low (Drda and Knox 1981).

The Aquaculture Project of the Florida Game and Freshwater Fish Commission (GFC) has conducted comprehensive surveys of the state's aquaculture industry every other year since 1981. The primary objective of these surveys has been to generate reasonably accurate and current information which was otherwise unavailable to be used by the GFC in planning and

management decisions affecting the aquaculture industry. This information has also been useful to aquaculturists and prospective aquaculturists wishing to know the status of the industry. Highlights of the most recent survey, completed in 1983, are the subject of this paper. A lack of space precludes coverage here of all parameters measured by the survey. Readers desiring more complete and detailed survey information may contact this writer.

Special thanks go out to Thomas Drda and Darrell Scovell for constructive criticism. Phyllis Armstrong, Joyce Ellerbe, and Kathy Tice were essential in typing, mailing, and data processing. Finally, and most importantly, thanks must be extended to the many aquaculturists who took the time to participate in the survey.

Methods

A survey containing 12 questions was mailed to 327 business firms thought to be raising freshwater fish or alligators commercially in Florida. Survey respondents were divided into 3 groups: 1.) ornamental fish producers, 2.) food/bait/game fish producers, and 3.) alligator producers. Food, bait, and game fish producers were combined into 1 category because all 3 types of fish are often raised on the same farm.

Certain activities were not considered to be within the scope of this survey. These included ornamental aquatic plant production, fish importing, and marine fin and shellfish production. The reason for excluding these groups was to keep the survey specific to aquaculture and to encourage a greater response rate by minimizing the length of the survey questionnaire.

Although respondents were encouraged to answer all 12 survey questions completely, they were also given the option of omitting answers to questions with which they felt uncomfortable. Therefore, N values are given along with each parameter reported in the data tables indicating the number of responses per question. Many ornamental fish species, subspecies, hybrids, and strains are cultured in Florida. To keep the number of different kinds of cultured ornamental fishes to a manageable level, these fishes were divided into 12 groups as follows: guppies, mollies, swordtails, variatus/platies, tetras, gouramies, tropical catfish, barbs, cichlids, goldfish, koi, and others. The first 4 groups are live-bearers, the rest are primarily egglayers. Some groups, such as cichlids, contain several genera and many species; others, such as mollies, contain a single genus and very few species.

Statewide estimates for number and area of ponds and production values were made using the survey data. In order to accomplish this, it was assumed that there were 300 aquaculture establishments in the state. This is because the mailing list contained 327 addresses thought to be engaged in commercial aquaculture, and there were approximately 27 questionnaires returned either undeliverable or indicating that they were not engaged in aquaculture. It was further assumed that the data generated by this survey was reasonably accurate

and representative of the industry. The method used in making these estimates was a simple algebraic proportionality, using the *N*-value for each parameter. For example, if 20 aquaculturists had 1,000 ponds, then the average per farm would be 50 ponds. If there are 300 farms, then the estimate for total number of ponds would be 15,000. Since it was not possible to quantify the accuracy of each response on each question, no attempt was made to statistically quantify the degree of error inherent in this type of estimation.

Results and Discussion

One hundred thirteen surveys were returned at least partially completed (a 34% return rate). Of these, 25 were considered to be out of the scope of this survey, leaving 88 respondents raising freshwater fish or alligators. Of the 88 respondents, 65 (74%) raised ornamental fishes, 12 (14%) raised food/bait/game fishes, 8 (9%) raised alligators and 3 (3%) raised fish for sale, but did not specify the species. There was a total of 7,094 ponds covering 264 ha. The annual value of cultured aquatic animals to producers was \$6,775,719.50 (Table 1).

Ornamental Fish Production

Ornamental fish producers had 6,656 ponds or 94% of the total number of ponds for all respondents. Total pond area for ornamental fish producers was 110 ha, or 42% of total pond area (Table 2). The large number of very small ponds demonstrates one of the major physical differences between ornamental fish culture and other types of aquaculture where earthen ponds are used. Ornamental fish producers use larger numbers of smaller sized ponds than is customary in other types of warm water fish culture in the United States. The average ornamental fish culturist in this survey had 113 ponds covering 2 ha.

Thirty-four ornamental fish producers sold 26,081,237 fish annually. Annual production value of 44 respondents who reported was \$6,067,279.50, (90% of the total value for all survey respondents). The most numerous group of fishes produced was guppies at 9,102,600. The most valuable group was swordtails at \$544,155. Swordtails were also the most frequently produced fish. Forty-seven out of 62 farms raised swordtails (Table 3).

Table 1. Physical and economic data for all respondents.

	Total	<i>N</i>	Avg./Farm	Range
Pond area (ha)	264	72	3.7	0.02 to 46.54
<i>N</i> ponds	7,094	78	91	1 to 400
Total annual value (\$)	6,775,719	54	125,476	72 to 2,050,000

Table 2. Physical and economic data for ornamental fish farms.

	Total	N	Avg./Farm	Range
Pond area (ha)	110	56	2.0	0.03 to 14.08
N ponds	6,656	59	113	1 to 400
Total annual value (\$)	6,067,279	44	137,892	850 to 2,050,000

Food, Bait, and Game Fish Production

Twelve of 88 respondents raised food/bait/game fishes. Producers in this group had 229 ponds covering 103 ha. The average farm in this group had 19 ponds covering 10 ha (Table 4).

Channel catfish were the most frequently raised food fish. Ten producers raised catfish and 7 raised them exclusively. The most frequently raised bait-fish was the golden shiner. Three respondents raised golden shiners but none raised them exclusively. Largemouth bass were the most important gamefish cultured and were raised on 2 farms. Food, bait, and game fish farmers reported an annual total production value of \$270,012. Food sized channel catfish accounted for \$217,412 (81%) of the total production value (Table 5).

Alligator Production

Alligator farmers were the least numerous of the 3 groups of aquaculturists surveyed. Eight survey respondents indicated that they raised alligators. This group had 29 ponds covering 47 ha. Table 6 shows that the average alligator farm had 6 ponds covering 9 ha.

Table 3. Frequency, quantity and value of fish sold by ornamental fish farms.

	N farms raising	% farms raising	N fish	Total annual value (\$)
Guppies	38	61	9,102,600	132,300
Mollies	43	69	2,102,200	167,301
Swordtails	47	75	2,767,477	544,155
Variatus/platies	39	63	3,267,450	304,129
Tetras	15	24	1,930,900	319,300
Gouramies	31	50	1,048,250	261,572
Tropical catfish	18	29	254,950	177,055
Barbs	23	37	789,400	274,481
Cichlids	39	63	741,860	374,962
Goldfish	4	7	3,000,000	
Koi	1	2		
Others ^a	8	13	1,076,150	123,450
N	62		34	33
Total			26,081,237	2,678,705
Average/farm			767,095	81,172.89

^a Others include ghost shrimp (*Palaemonetes* sp.), crayfish, hog choker, snail, paradise fish, and danio.

Table 4. Physical and economic data for food, bait, and game fish farms.

	Total	N	Avg./Farm	Range
Pond area (ha)	103	10	10.3	0.02 to 46.54
N ponds	229	12	19	1 to 400
Total annual value (\$)	278,412	8	34,801	240 to 180,000

The annual production value of this group was difficult to ascertain. Six of 8 respondents failed to indicate quantities or values for their alligator production. Several respondents said that they had not sold any alligators yet because they had only recently entered the business. One respondent projected annual revenues of \$300,000. Another respondent sold 500 alligators annually, valued at \$130,000.

State Estimates

Using survey data it was estimated that there were 27,300 ponds covering 1,093 ha involved in freshwater aquaculture in Florida (Table 7). The estimate for annual production value to the producer was \$37,642,884. In

Table 5. Frequency, quantity, and total value of fish sold by category by food, bait, and game fish farms.

	N farms raising	Number of fish (N)	Pounds of fish (N)	Annual value (\$) (N)
Food fish				
Channel catfish	10	420,000 (4)	252,860 (5)	229,912 (7) ^a
Tilapia	1	20,000 (1)		2,000
American eel	1		800 (1)	1,600 (1)
Macrobrachium	1			
Bait fish				
Golden shiner	3		13,000 (2)	27,000 (1)
Fathead minnow	1			
Game fish				
Largemouth bass	2	10,000 (1)		5,000 (1)
Redear sunfish	2	5,000 (1)		1,250 (1)
Bluegill	2	5,000 (1)		1,250 (1)
Other				
Hybrid striped bass (game)	1			
Crayfish (food)	1			
American eel (bait)	1	3,000 (1)		1,500 (1)
American eel (ornamental)	1	700 (1)		210 (1)
Mosquito fish	1	10,000 (1)		500 (1)
N	12	5	7	8
Total		473,700	266,660	270,012

^a For channel catfish, \$217,412 was in food size fish and \$12,500 was in fingerling size fish.

Table 6. Physical and economic data for alligator farms.

	Total	N	Avg./Farm	Range
Pond area (ha)	47	5	9.5	0.02 to 24.08
N ponds	29	5	6	1 to 17
Total annual value (\$)	430,000	2	215,000	130,000 to 300,000

Table 7. Estimates for selected physical and economic parameters in Florida aquaculture.

	All farms	Ornamental fish	Food, bait, game fish	Alligators
Pond area (ha)	1,093	459	426	197
N ponds	27,300	25,662	819	109
Total annual value (\$)	37,642,884	33,878,595	1,505,715	2,258,573

terms of pond numbers, pond area, and annual production value, ornamental fish culture was the dominant form of freshwater aquaculture in the state.

The results of these statewide surveys have proven useful in several ways. The GFC's Aquaculture Project has used this information to tailor research and extension activities around current problems and interests within the aquaculture community. The GFC has been able to use the information to assess possible need for regulatory changes and possible impacts of regulatory changes. It has reduced friction between government and industry by increasing communication between the two. The most important benefit to the GFC has been to ensure a more effective and responsive approach to management decisions with respect to aquaculture. The first step in effectively managing any resource is to determine the nature of that resource and its users.

Literature Cited

- Brown, E. E. and J. B. Gratzek. 1980. *Fish Farming Handbook*. AVI Publishing Co., Inc., Westport, Conn. 391pp.
- Drda, T. F. and R. M. Knox. 1981. *Florida Aquaculture Survey 1980-81*. Fla. Game and Fresh Water Fish Comm. Mimeo rep. Tallahassee, Fla. 27pp.
- Kerr, J. R. 1974. *Exploratory survey of the Tropical Fish Industry in Florida*. Fla. Tropical Fish Farms Assoc. Winter Haven, Fla. Mimeo rep. 22pp.
- Socoloff, R. 1980. *Tropicals*. Pages 163-206 in E. E. Brown and J. B. Gratzek, *Fish Farming Handbook*. AVI Publishing Co., Inc. Westport, Conn.
- Taber II, R. G. 1982. *Inventory of Agricultural Acreages in the Wimauma/Ruskin Area of the Alafia River Basin*. Southwest Fla. Water Manage. Dist. Mimeo rep. Brooksville, Fla. 4pp.